REPUBLIC OF SLOVENIA | MINISTRY OF THE ENVIRONMENT AND SPATIAL PLANNING

Global Water Partnership Mediterranean

MIO-ECSDE

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

Capacity Building Workshop on
"Shared Groundwater Resources Management"

2 – 4 December 2008 / Postojna, Slovenia

Guidelines for spatial development on karstic areas

Centre of excellence FABRICA and Lipica case study

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SAVA RIVER BASIN COMMISSION

FABRICA

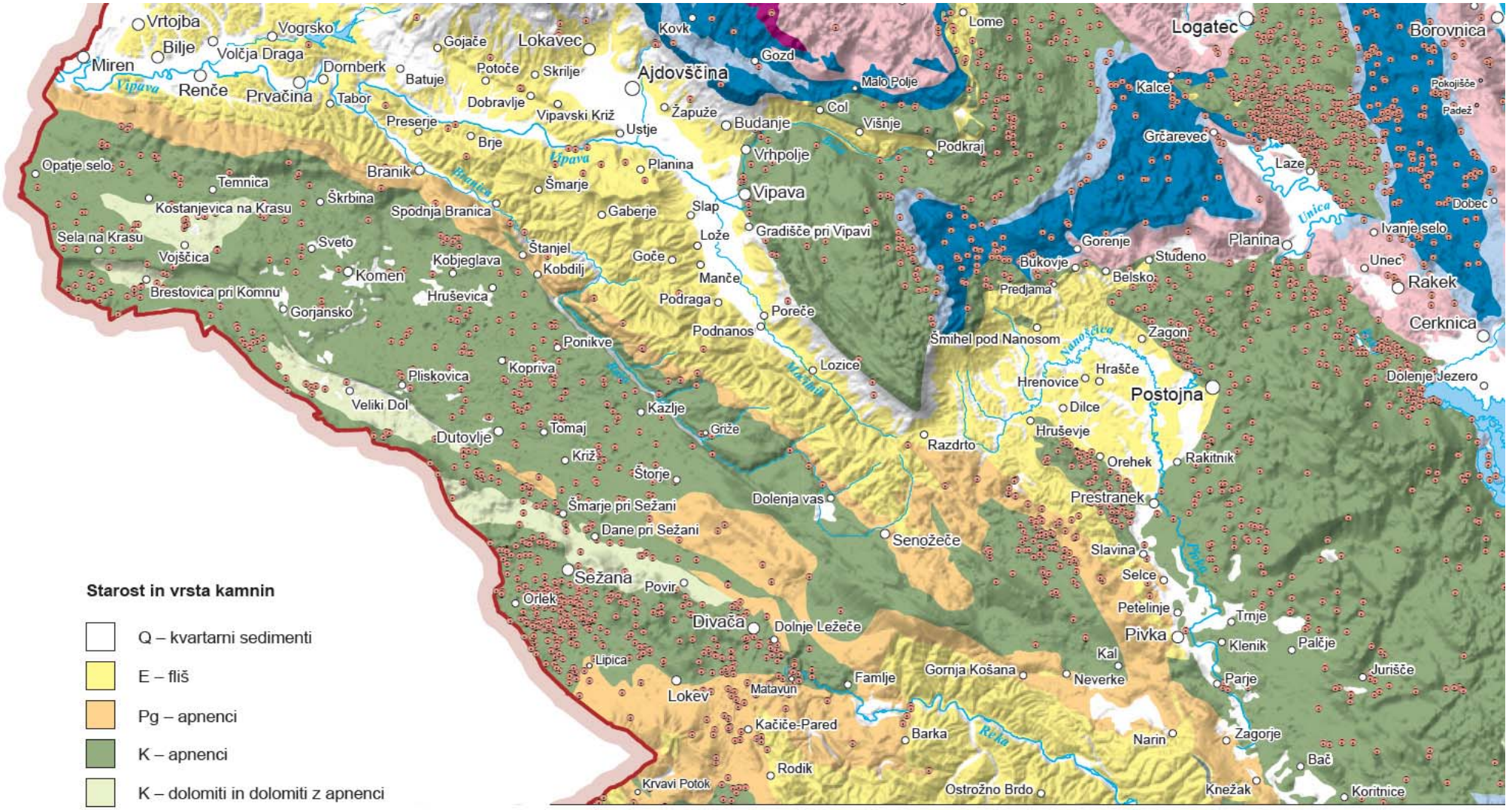
- Centre of excellence
- Coordinated by the Scientific Research Centre of the SASA
- 8 partners

Highlights

- Sustainable development of the karstic landscape
- Groundwater tracking
- Wind and Sun energy
- Land use
- Building heritage
- Cultural heritage
- Tourism
- Rocks and relief
- Biodiversity
- Migrations
- People and landscape

Rocks and relief

- Various surface karst features dominate
- Gravely truncated water system



Starost in vrsta kamnin

- Q – kvartarni sedimenti
- E – fliš
- Pg – apnenci
- K – apnenci
- K – dolomiti in dolomiti z apnenci
- J – apnenci
- J – dolomiti in dolomiti z apnenci
- T – apnenci
- T – dolomiti

jama

KRAS

Slika 15: Geološka karta z jamami

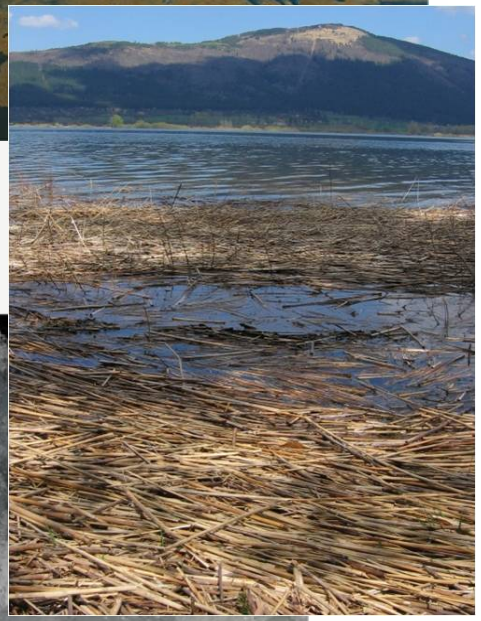
Merilo 1 : 200.000

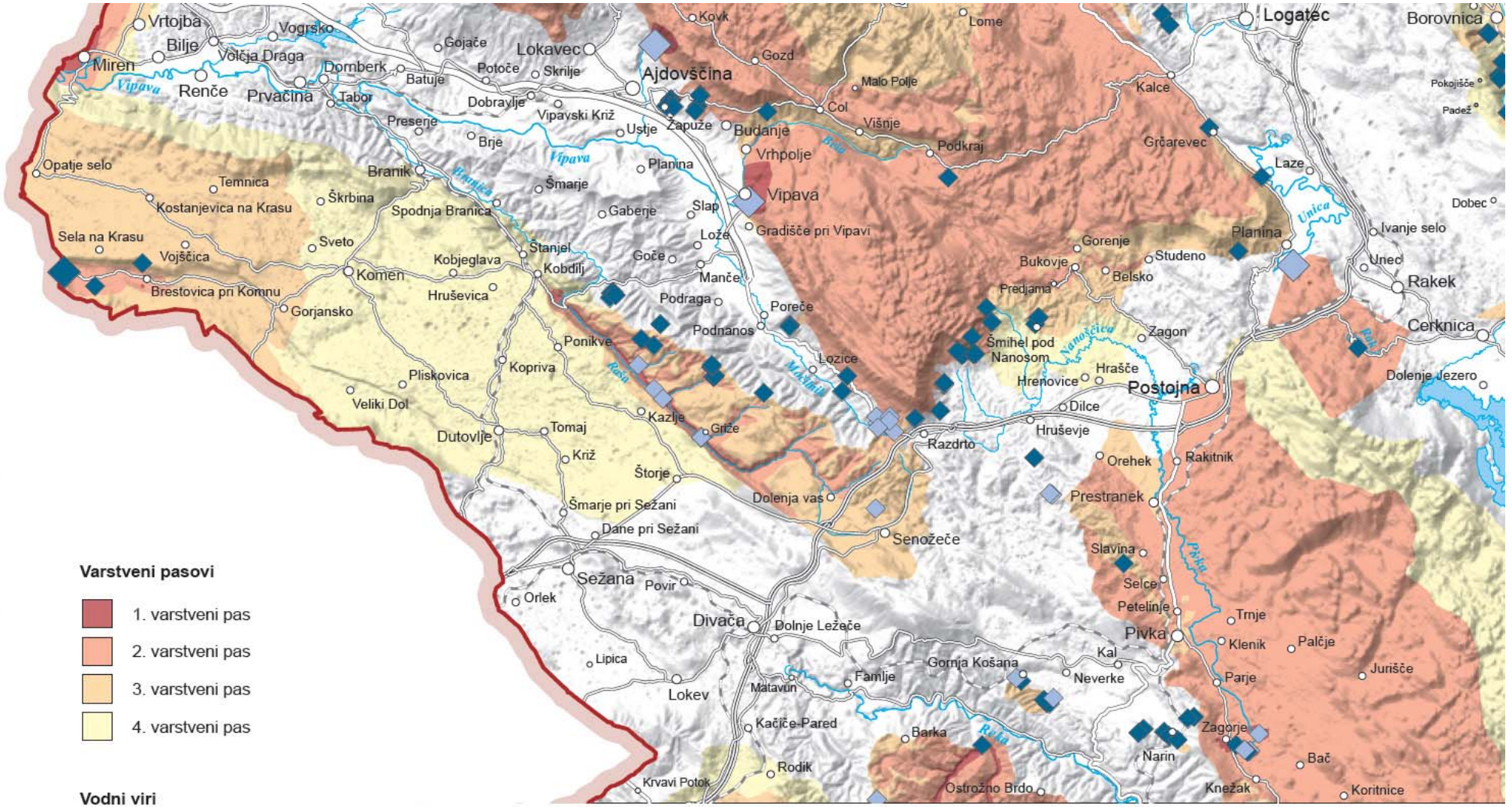
Avtorja vsebine: Nadja Zupan Hajna, Jurij Hajna; kartografija: Jerneja Fridl

Vir: Osnovna geološka karta 1 : 100.000, Geološki zavod Slovenije; DMV 100, Geodetska uprava RS; Kataster jam IZRK ZRC SAZU in JZS

Water

- More than half of water supplies in Slovenia are provided by karst aquifiers
- Extremely vulnerable to various effects of human activities
- Quick pollution spread
- Functioning of the water systems is important





Slika 62: Raba in varovanje voda na krasu

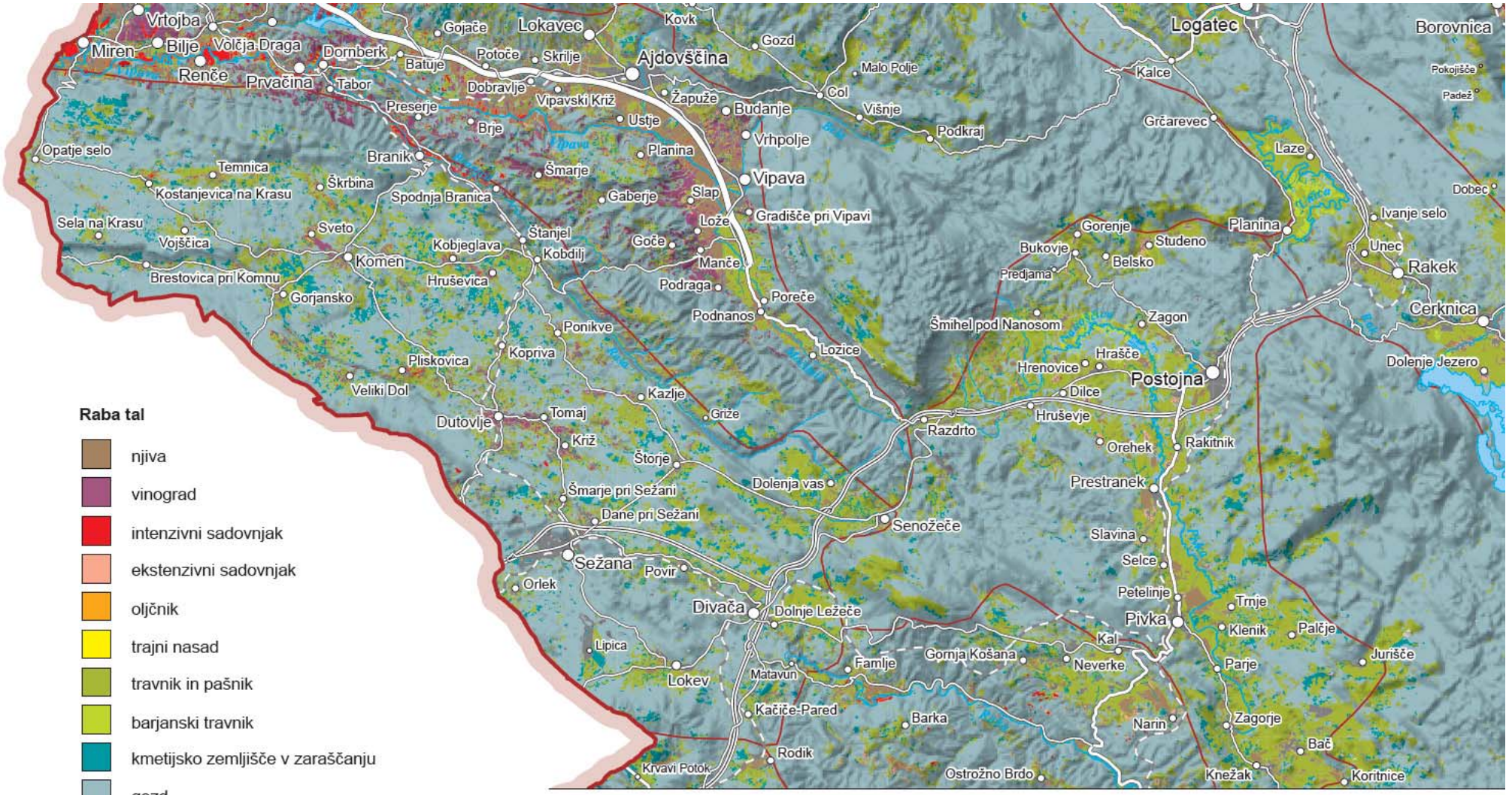
Merilo 1 : 200.000

Avtorja vsebine: Metka Petrič, Jurij Hajna; kartografija: Jerneja Fridl

Vir: Agencija RS za okolje – EUROWATERNET

Land use

- One of the best indicators of the landscape structures and processes
- Finding favourable areas for agriculture and settlements



Raba tal

- njiva
- vinograd
- intenzivni sadovnjak
- ekstenzivni sadovnjak
- oljčnik
- trajni nasad
- travnik in pašnik
- barjanski travnik
- kmetijsko zemljišče v zaraščanju
- gozd
- neporaslo zemljišče
- pozidano
- močvirje in trstičje
- voda
- meja regije

KRAS

Slika 2: Dejanska raba tal leta 2002

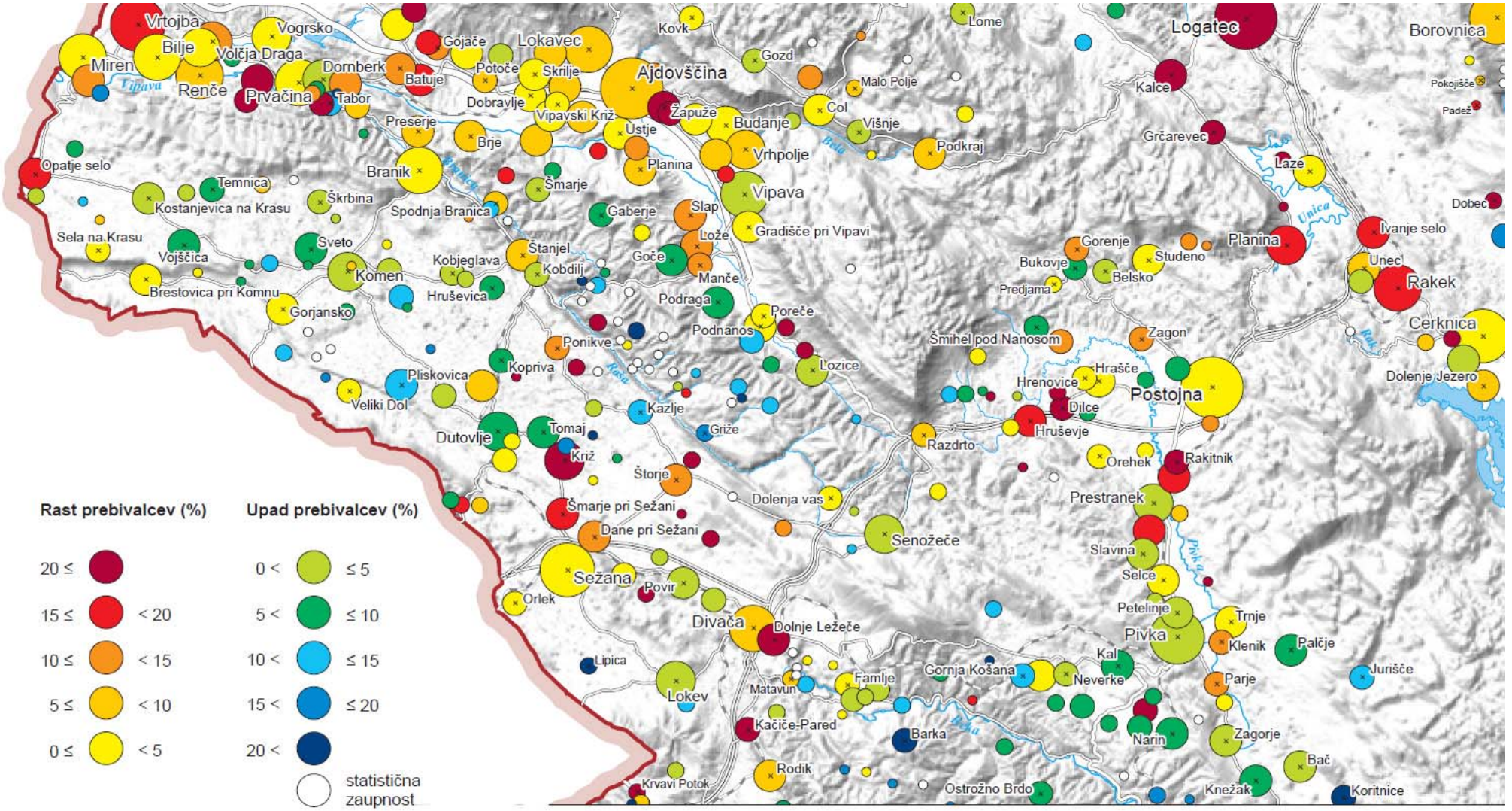
Merilo 1 : 200.000

Kartografija: Jerneja Fridl, Franci Petek

Vir: Ministrstvo za kmetijstvo, gozdarstvo in prehrano

People

- Countryside settlements are dominant
- Strong “urbanisation” is present
- Influenced by natural circumstances, geopolitics and the location of traffic routes
- Depopulation



Slika 5: Spreminjanje števila prebivalcev med letoma 1991 in 2002

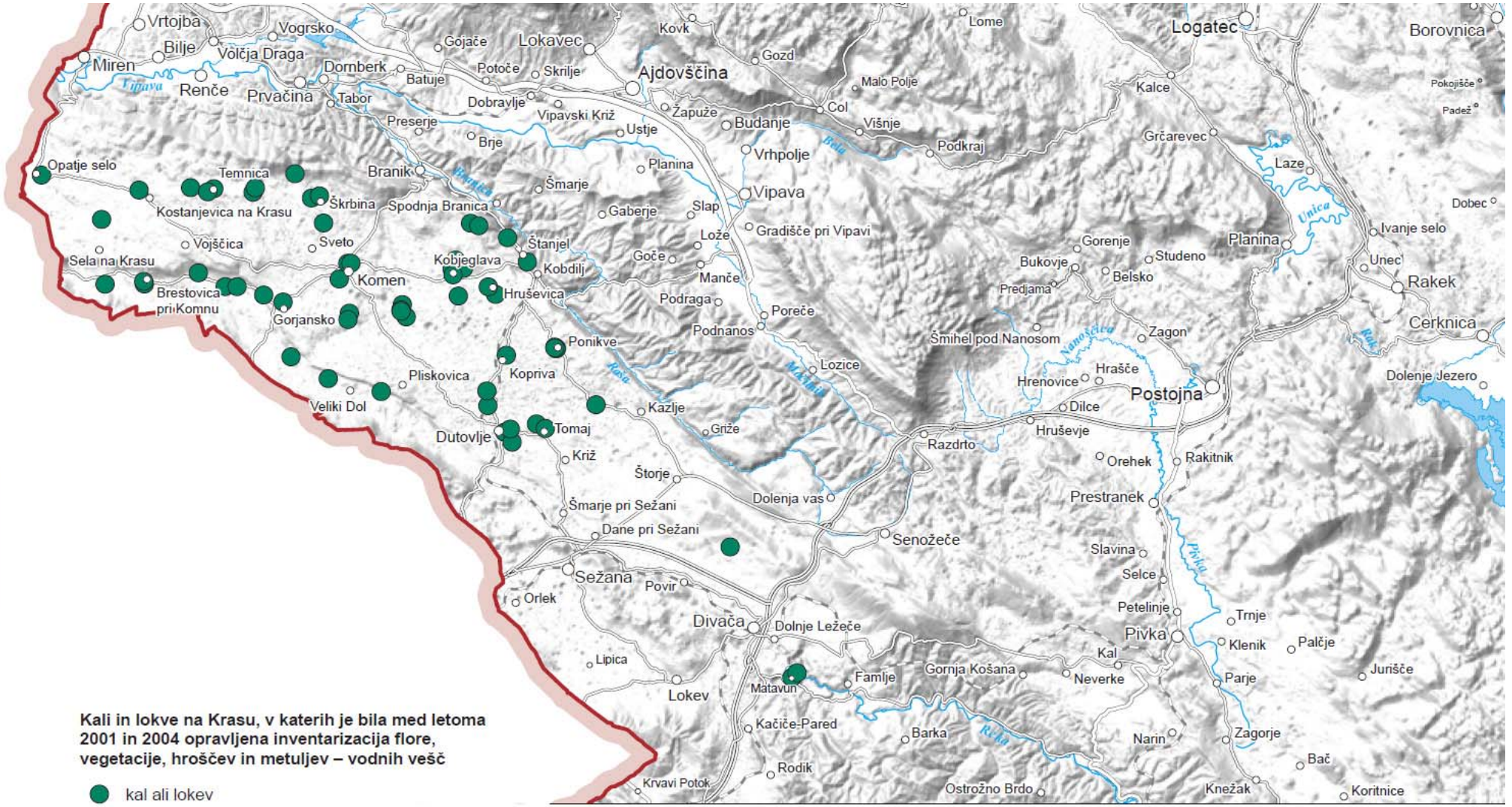
Merilo 1 : 200.000

Kartografija: Jerneja Fridl

Vir: Popis 2002, Statistični urad RS

Nature

- Biodiversity
- Kras rich with flora, fauna and vegetation
- One of the biodiversity “hot spots”
- Traditional land use is abandoned



Kali in lokve na Krasu, v katerih je bila med letoma 2001 in 2004 opravljena inventarizacija flore, vegetacije, hroščev in metuljev – vodnih vešč

● kal ali lokev

Slika 25: Kali in lokve na Krasu

V navidez suhi pokrajini brez površinskih voda predstavljajo kali in lokve edina bivališča vodnih in močvirskih, rastlinskih in živalskih vrst na Krasu. Kljub dejstvu, da so kali in lokve antropogeno pogojeni krajinski elementi, je njihovo vzdrževanje in ohranjanje smiselno s stališča ohranjanja vrstne, ekosistemske in krajinske pestrosti; v okviru slednje tudi kot del naravne in kulturne dediščine Krasa.

KRAS

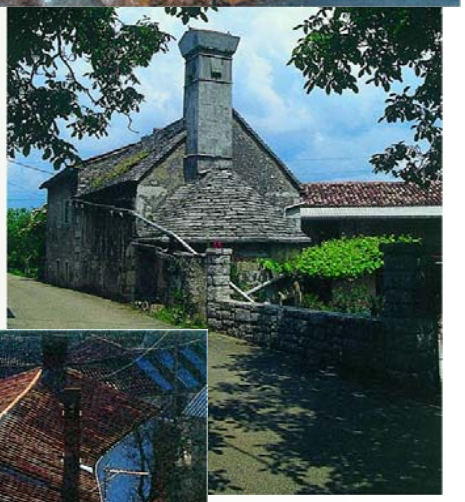
Merilo 1 : 200.000

Kartografija: Jerneja Fridl

Avtorji vsebine: Valerija Babij, Tatjana Čelik, Igor Zelnik, Branko Vreš, Aljoša Pirnat, Andrej Seliškar

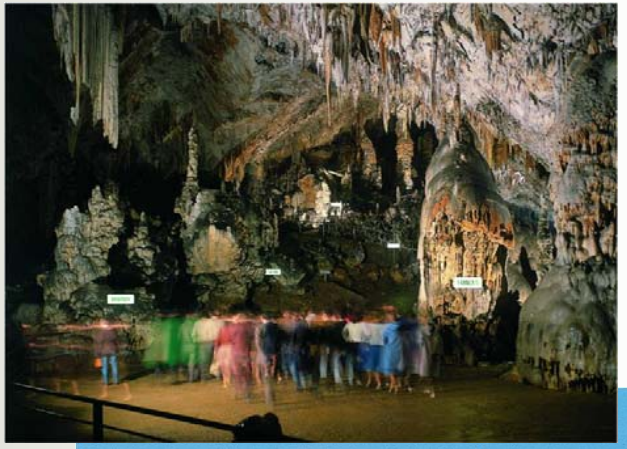
Cultural heritage

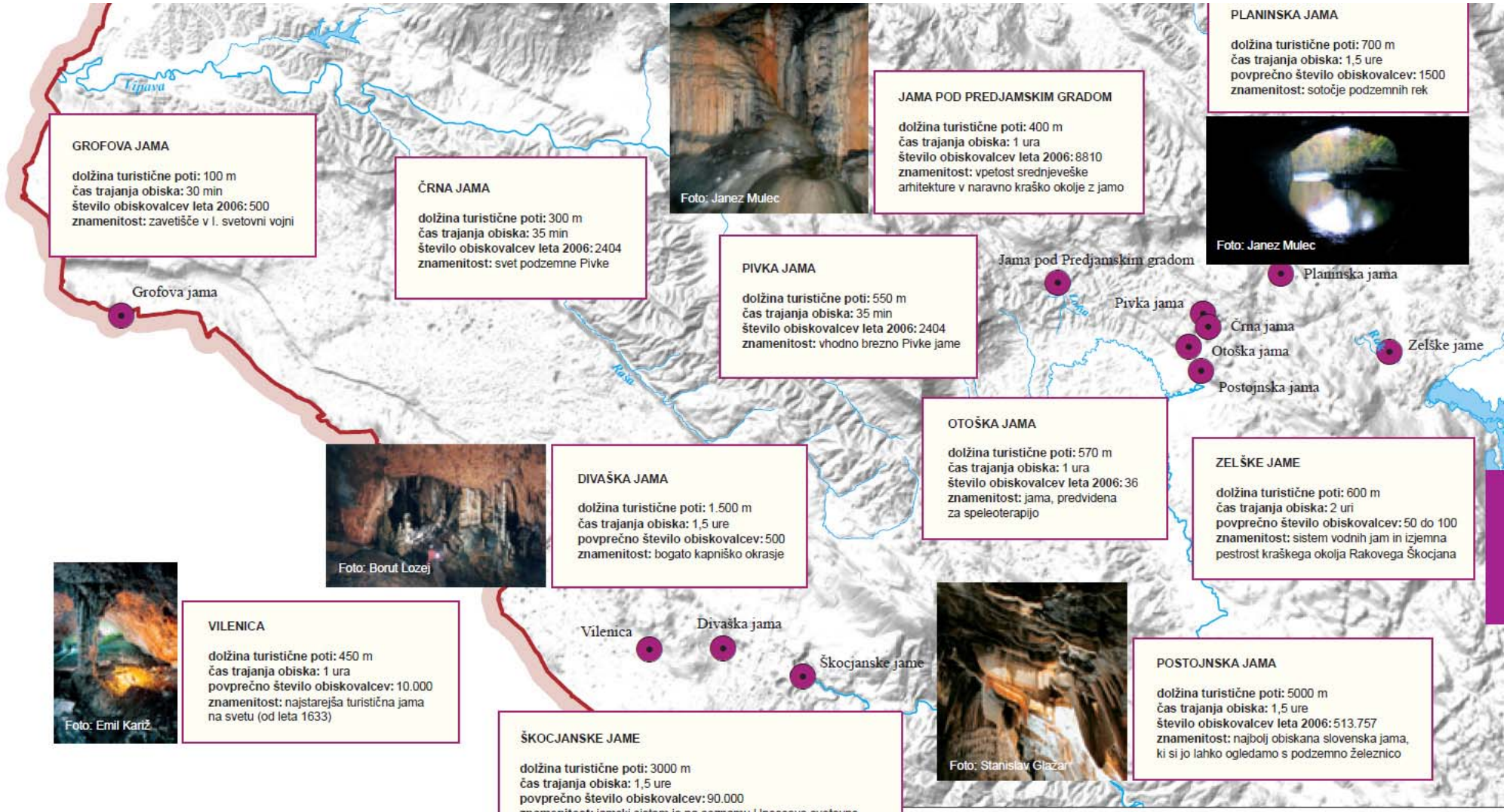
- Architectural heritage
- Radical changes in the last 60 years
- Inconsiderate investment policies
- Large investors in the real estate market
- Reinvention of building tradition



Tourism

- Cave tourism – one of the oldest forms of tourism
- Postojna – more than 500,000 visitors annually
- Potential burden imposed by tourism
- sustainable tourism





GROFOVA JAMA

dolžina turistične poti: 100 m
čas trajanja obiska: 30 min
število obiskovalcev leta 2006: 500
znamenitost: zavetišče v I. svetovni vojni

ČRNA JAMA

dolžina turistične poti: 300 m
čas trajanja obiska: 35 min
število obiskovalcev leta 2006: 2404
znamenitost: svet podzemne Pivke

JAMA POD PREDJAMSKIM GRADOM

dolžina turistične poti: 400 m
čas trajanja obiska: 1 ura
število obiskovalcev leta 2006: 8810
znamenitost: vpetost srednjeveške arhitekture v naravno kraško okolje z jamo

PLANINSKA JAMA

dolžina turistične poti: 700 m
čas trajanja obiska: 1,5 ure
povprečno število obiskovalcev: 1500
znamenitost: sotočje podzemnih rek

PIVKA JAMA

dolžina turistične poti: 550 m
čas trajanja obiska: 35 min
število obiskovalcev leta 2006: 2404
znamenitost: vhodno brezno Pivke jame

DIVAŠKA JAMA

dolžina turistične poti: 1.500 m
čas trajanja obiska: 1,5 ure
povprečno število obiskovalcev: 500
znamenitost: bogato kapniško okrasje

OTOŠKA JAMA

dolžina turistične poti: 570 m
čas trajanja obiska: 1 ura
število obiskovalcev leta 2006: 36
znamenitost: jama, predvidena za speleoterapijo

ZELŠKE JAME

dolžina turistične poti: 600 m
čas trajanja obiska: 2 uri
povprečno število obiskovalcev: 50 do 100
znamenitost: sistem vodnih jam in izjemna pestrost kraškega okolja Rakovega Škocjana

VILENICA

dolžina turistične poti: 450 m
čas trajanja obiska: 1 ura
povprečno število obiskovalcev: 10.000
znamenitost: najstarejša turistična jama na svetu (od leta 1633)

ŠKOCJANSKE JAME

dolžina turistične poti: 3000 m
čas trajanja obiska: 1,5 ure
povprečno število obiskovalcev: 90.000
znamenitost: jamski sistem je na seznamu Unescove svetovne dediščine, podzemno mokrišče (Ramsar) in kraško biosferno območje

POSTOJNSKA JAMA

dolžina turistične poti: 5000 m
čas trajanja obiska: 1,5 ure
število obiskovalcev leta 2006: 513.757
znamenitost: najbolj obiskana slovenska jama, ki si jo lahko ogledamo s podzemno železnico

turistična jama

Slika 44: Turistične jame

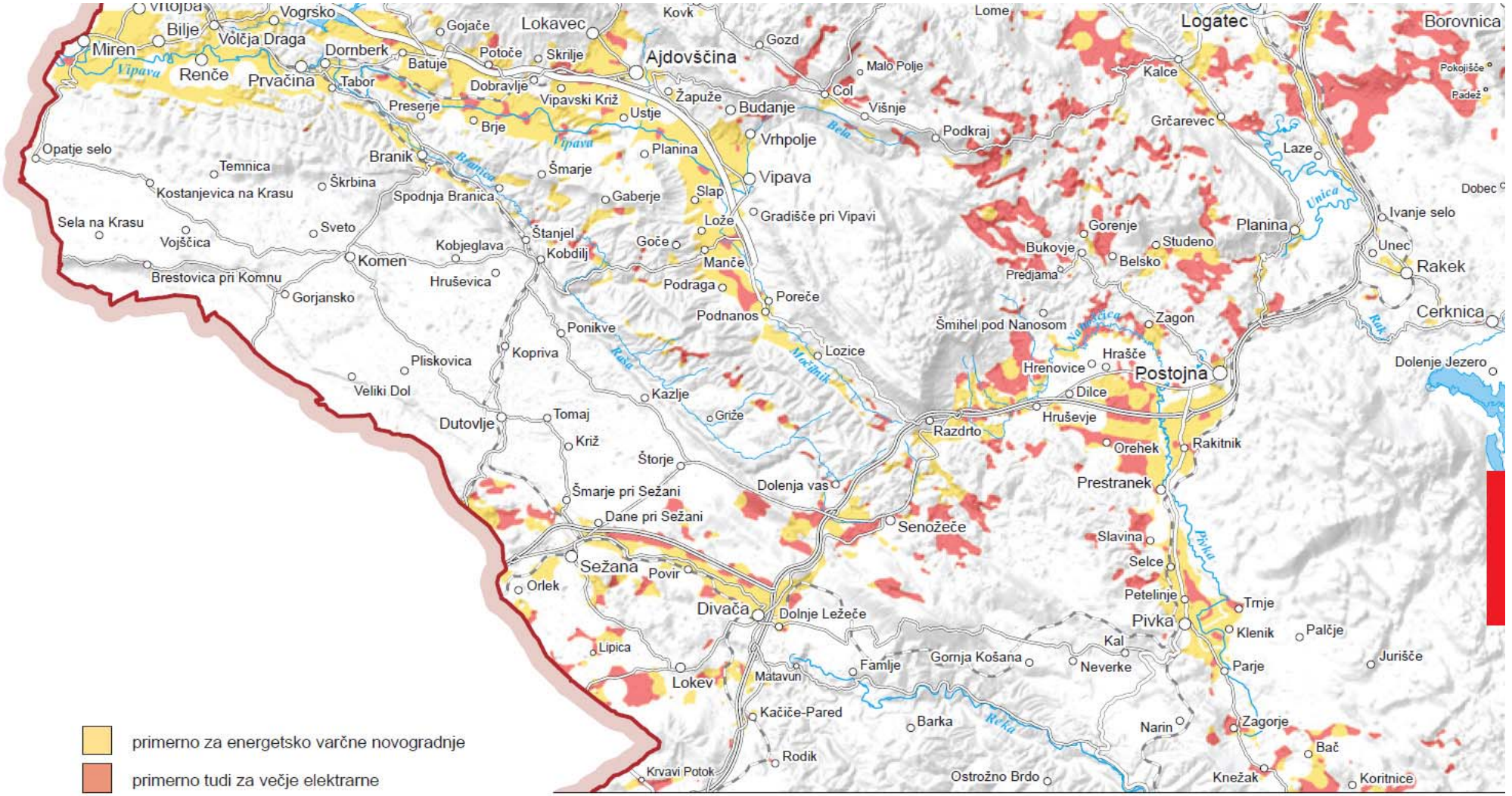
Merilo 1 : 200.000

Avtorji vsebine: Franci Gabrovšek, Andrej Kranjc, Janez Mulec; kartografija: Jemeja Fridl

Vir: Kataster jam IZRK ZRC SAZU in JZS

Energy

- Energy efficient building
- Use of renewable energetic sources
- Solar energy
- Mapping areas suitable for exploitation of solar energy
- Design of energy-efficient buildings



Slika 35: Primernost prostora za novogradnje

Merilo 1 : 200.000

Avtor vsebine: Klemen Zakšek; kartografija: Klemen Zakšek, Jemeja Fridl

Vir: Osončenost in Naravovarstveni atlas, ARSO; DMV 12,5; © Geodetska uprava RS

Achievements

- Updated records of rural activities and assessment of overgrowing, with a simulation of the future development.
- An assessment of the possibilities for the expansion of cave tourism and its impact on the environment.
- Solar radiation modelling based on current satellite measurements.

Achievements (2)

- Identification of biodiversity hotspots.
- The analysis of the consequences caused by the neglect of the architectural heritage.
- Updated settlement records and presentation of daily migrations.
- The plan of the underground water system and an assessment of the level of threat.
- The updated picture of the ground composition and relief.

Situation of study in broader context

Idea

↳ Basic presentation of planned activities

↳ **Environmental Report**
(defines, describes and evaluates the environmental impact of the plan and possible alternatives while taking into account the goals and geographic characteristics of the area to which the plan pertains)

Directive 2001/42/EC; 27 June 2001

↳ Revison of the Environmental Report

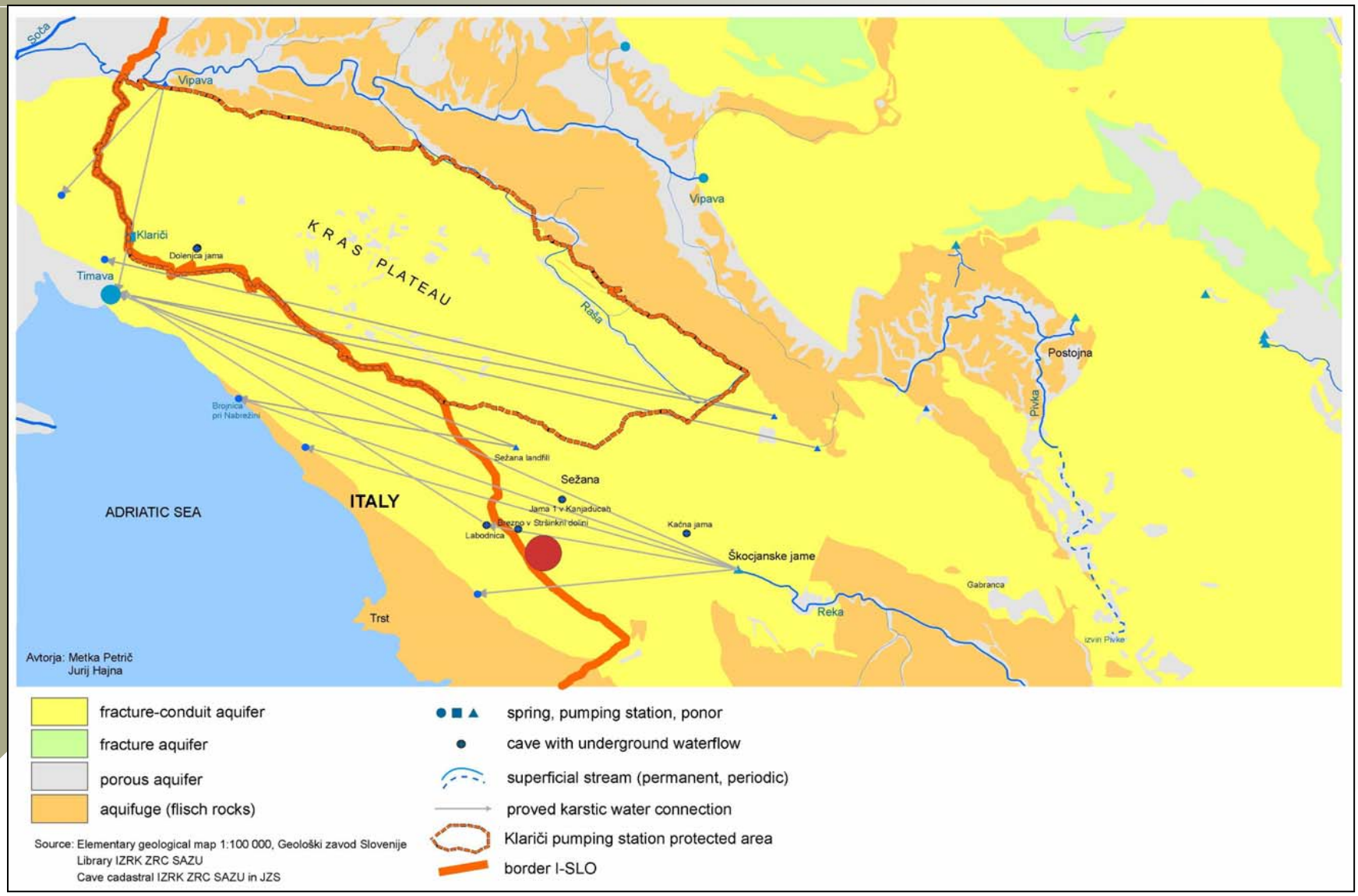
↳ Environmental Impact Assessment

LIPICA

- Location (Lipica Stud Farm; 1.5 km from I-SLO border)
- Plan (to expand Lipca Golf Course from present-day location toward W)
- environmental report (to evaluate influences of plan on population and environment – SLO and transboundary)

- Scientific Research Centre SAZU (ZRC SAZU)
  - Anton Melik Geographical Institute (9 researchers)
  - Jovan Hadži Institute for Biology (10 researchers)
  - Karst Research Institute (10 researchers)
  - Section for Interdisciplinary Research in Humanities (1 researcher)
  - 4 other researcher

Location


Soča
Vipava
Vipava
Klariči
Dolenjca jama
Timava
KRAS PLATEAU
Rača
Postojna
Pivka
Brojnica pri Nabrežini
Sežana landfill
Sežana
ADRIATIC SEA
ITALY
Jama 1 v Kanjadučah
Brezno v Strašinkil dolini
Labodnica
Kačna jama
Škocjanske jame
Gabranca
Reka
Trst
Izvir Pivke
Avtorja: Metka Petrič
Jurij Hajna
fracture-conduit aquifer
fracture aquifer
porous aquifer
aquifuge (flisch rocks)
spring, pumping station, ponor
cave with underground waterflow
superficial stream (permanent, periodic)
proved karstic water connection
Klariči pumping station protected area
border I-SLO
Source: Elementary geological map 1:100 000, Geološki zavod Slovenije
Library IZRK ZRC SAZU
Cave cadastral IZRK ZRC SAZU in JZS

Evaluation of plan

- Ground (soil and weathered karstic bedrock),
- Water (surface and underground),
- Climate,
- Population and human health,
- Cultural Landscape,
- Cultural Heritage,
- Nature (biology, protected areas-monuments, natural values and Natura 2000).

Estimation of plan's efects

-increased input of mineral fertilizers and pesticides (herbicides, fungicides, insecticides),

- increased application of water (shortage of water in the future, washing out of mineral fertilizers and pesticides),

- modifications of landscape (elimination of surface rocks, filling up of dolines, thickening of soil),

- clearing of 120 years old oak forest,

- increased risk for (transboundary) fire,

- there is no registered caves on the plan area.

Conclusions of study

- plan will have no effects to Slovene and transboundary (Italian) environment if proposed alternatives will be taken into account:
  - a part of old high-value oak forest have to be excluded from the plan due to particularly valuable beetle (*Morimus funereus*) and cultural-natural feature important at state level (underground black coal mine),
  - application of mineral fertilizers should not exceed quantity which is used at present-day golf course,
  - application of water has to be much lower than quantity that is used at present-day golf course and has to be strictly controlled,
  - modification of landcsape must not change karstic nature of landscape,
  - cultural landscape and heritage have to remain undamaged or should be mantained better,
  - eutrofication of artificial lake with mineral fertilizers must be prevented.

Final proposed spatial distribution of golf courses